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NEW SPECIES OF MITES OF THE SUBFAMILY TROMBICULINAE, WITH A KEY TO THE NEW WORLD LARVAE OF THE AKAMUSHI GROUP OF THE GENUS TROMBICULA.

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This paper deals with chigger mites (Trombiculinae) of the New World. One of the seven new species here described was taken from a hibernating blue-tailed skink in Maryland. Two are part of a collection from Colombia sent in for identification by Professor J. C. Bequaert of Harvard University. Four new species, all based on larvae, belong to the *akamushi* group and come from various New World hosts and localities.

Most of the material studied was prepared and mounted by Miss Grace E. Glance. Alcoholic specimens were treated with a solution of potassium hydroxide before they were mounted in a modified Berlese mixture. The clearing done by the different modified Berlese mixtures is not in itself sufficient in the case of chiggers, although satisfactory for certain other mites.

It will be noted that the character that is most used in separating the larvae of species of the Trombiculinae is the number of dorsal abdominal setae. Frequently one is inclined to believe that the number of such setae varies within a single species. However, this probably is not true. As the abdomen of a chigger swells following engorgement, its dorsal wall distends more rapidly than the ventral. This may cause certain dorsal setae that are very near to the lateral margin to be carried beyond this margin and have a slightly ventral position. When the dorsal setae are counted in such an engorged individual the number will be less than in an unengorged specimen. For these reasons it is best to confine the counts of dorsal setae to speci-

mens that are only slightly engorged. In unengorged specimens the dorsal abdominal setae are often so close together that there is confusion in counting them.

Since there is a tendency in most species for the dorsal abdominal setae to be grouped in transverse rows, some authors have given formulas to indicate not only the number of dorsal abdominal setae but also the number of such rows and the number of setae in each row. This practice can not be followed with safety in all species. In some of them the rows formed by the dorsal setae are too irregular for ready detection, and in all of them the setae shift their position somewhat during engorgement.

A New Species of *Neoschöngastia* Ewing.

Species of *Neoschöngastia*, all of which are known only in the larval stage, are characterized by having five setae (exclusive of pseudostigmatic organs) on the dorsal plate, the pseudostigmatic organs strongly clavate or capitate, the palpal claws trifurcate and the chelicerae each with only one dorsal tooth. About a dozen species are known from the New World.

Neoschöngastia dasyproctae, new species.

Palpus stout; second segment broadly rounded laterally; first palpal seta with several minute, short barbs; second and third simple. Palpal claw with middle prong stoutest; outer prong stouter, shorter, and nearer base of claw than inner. Dorsal plate much broader than long, anteriorly rounded on front margin near insertion of each of three anterior setae and very broadly rounded on posterior margin. Pseudostigmata situated slightly posterior to middle of dorsal plate and each slightly more than its diameter from median line. A curved transverse slit is contiguous with anterior, and another with posterior, margin of each pseudostigma. Pseudostigmatic organ strongly clavate, barbed, with a slender pedicel and extending backward beyond posterior margin of dorsal plate. Eyes of a side equal, contiguous, not situated on a sclerotized plate. Dorsal abdominal setae as follows: Humerals much in front of first row and not included in formula, which is 6–6–6–6 (including first laterals) –4 (including second laterals) –4 (including third laterals). Legs rather large; tarsus I with dorsal spine rather weak and situated about its length from base of segment.

Length of partly engorged specimen, 0.40 mm.; width, 0.22 mm.

Type host.—An agouti, *Dasyprocta variegata.*

Type locality.—Muzo, Boyacá Department, Colombia.

Type slide.—U. S. N. M. No. 1260.

Described from six specimens taken from type host at type locality January 1, 1937, by M. Roca Garcia. This species is nearest *N. scelopori* Ewing, from which it differs in having a slit behind each pseudostigma and no tubercle on tarsus I.

An Adult of a New Species of Trombicula.

Adults of the subfamily Trombiculinae are rarely found and have been reared only in the case of three or four species. It has been the writer's practice to put all new adults in the genus *Trombicula*. This practice should avoid creating many generic synonyms.

Trombicula manriquei, new species.

Palpus slender, extending about one-half its length beyond the chelicerae. Palpal thumb slender, well clothed with setae, and slightly surpassing tip of palpal claw; palpal claw rather slender, without tooth, moderately curved; accessory spines three, subequal, arranged in a comb. Crista extending forward as a pointed rod between bases of chelicerae and expanded posteriorly into a laterally rounded pseudostigmatic area, the latter without posterior lobes. Pseudostigmata small, situated on extreme lateral margins of pseudostigmatic area; pseudostigmatic organs simple, flagelliform, longer than crista. Eyes absent. Abdomen densely beset with tapering, barbed setae which increase progressively in length from anterior to posterior border. Anterior legs longest; posterior next in length; legs of second and third pairs subequal. Claws on tarsus I unequal, also those on tarsus IV unequal; those on tarsus II subequal, and on tarsus III subequal.

Length of body, 0.96 mm.; greatest width, 0.53 mm.

Type locality.—Villavicencio (Quenane), Meta Department, Colombia.

Type slide.—U. S. N. M. No. 1261.

Description based upon one specimen taken from humus in a tree hole at the type locality October 26, 1936, by J. R. Manrique, for whom the species is named. Although this specimen is small for an adult of the genus *Trombicula*, the presence of three accessory spines near the base of the palpal claw and of three pairs of genital suckers surrounding the genital opening indicates that it is an adult. This species is nearest *T. coarctata* Berlese and *T. splendens* Ewing, from both of which it differs in having no posterior lobes to the pseudostigmatic area.

The *irritans* Group of the Genus Trombicula.

This group of the genus *Trombicula* includes those species in the larvae of which the palpal claw is typically divided into two prongs and the pseudostigmatic organ is barbed or plumose. About two dozen species have been described from the New World, fully one-fourth of which are synonyms. The new species here described is based on larvae.

Trombicula gurneyi, new species.

Palpus short, stout; second segment broadly rounded laterally; first palpal seta short, with 0 to 2 barbs (usually without barbs); second short, simple; third simple. Inner prong of palpal claw stouter than outer, the latter being less curved and in a somewhat ventral position. Dorsal plate broader than long, not porose, almost straight along anterior margin and outwardly rounded along posterior margin. Pseudostigmata situated

almost between posterolateral setae and each a little more than its diameter from median line. A slight chitinous fold may be present at either the anterior or posterior border of the pseudostigmata. Pseudostigmatic organs each with rather long barbs on distal half. Eyes of a side equal, contiguous, not situated on a sclerotized plate. Dorsal abdominal setae as follows, counting the humerals as belonging to first row, 8–6–4–4 (including first laterals) –2 (not including second laterals). Legs moderate in length; tarsus I with dorsal spine situated slightly more than its length from base of segment; subapical seta straight, on apex of a tubercle.

Length of slightly engorged specimen, 0.27 mm.; width, 0.21 mm.

Type host.—Blue-tailed skink, *Eumeces fasciatus.*

Type locality.—Priest Bridge, Patuxent River, Maryland.

Type slide.—U. S. N. M. No. 1262.

Described from six specimens taken from type host collected at type locality April 24, 1937, by A. B. Gurney. When the type host was found it was in a state of hibernation, deep in a large pile of sawdust. The chiggers probably attached to the host when the latter was active before going into hibernation. This species is nearest *T. panamensis* Ewing, from which it differs in sometimes having the first palpal seta with one or two barbs and in having the palpal setae very short.

The *akamushi* Group of the Genus Trombicula.

Chiggers of this group of the genus *Trombicula* are here defined as those which have the palpal claw divided into three or four prongs and which possess barbed pseudostigmatic organs. Members of the group are well clothed with abdominal setae, and are distributed over most of the known geographical range of the subfamily Trombiculinae. The species which gives the group its name is *T. akamushi* (Brumpt), the well known Asiatic chigger that transmits to man a serious disease known as Kedani fever, or Tsutsugamushi disease.

Key to the New World Species of the *akamushi* Group of the Genus Trombicula.

A. First palpal seta barbed.
  B. Dorsal abdominal setae more than 54; palpal claw pronged.....*T. setosa*, new species.
  BB. Dorsal abdominal setae less than 50.
    C. Dorsal abdominal setae more than 30.
      D. Dorsal abdominal setae more than 44. *T. shannoni* Ewing.
      DD. Dorsal abdominal setae not more than 40.
        E. Dorsal plate almost twice as broad as long and with a slit behind each pseudostigma.....*T. bisignata* Ewing.
        EE. Dorsal plate less than one and a half times as broad as long and without a slit behind each pseudostigma..... *T. cynos*, new species.

CC. Dorsal abdominal setae less than 26; dorsal plate indistinct.....*T. dasyproctae*, new species.

AA. First palpal seta simple.

B. Dorsal abdominal setae more than 34; dorsal plate with a slit *in front of* each pseudostigma. On bats....
T. mexicana, new species.

BB. Dorsal abdominal setae less than 30; dorsal plate with a slit *behind* each pseudostigma. Not on bats.....
T. microti Ewing.

FOUR NEW SPECIES OF THE *akamushi* GROUP FROM THE NEW WORLD.

Larvae of the New World species of the *akamushi* group differ from those of *Trombicula akamushi* Brumpt in having the anterior eye equal to or larger than the posterior. Of our species *T. bisignata* Ewing appears to be nearest to the Asiatic species. *T. bisignata* differs from *T. akamushi* not only in the character just mentioned but also in possessing a pair of slit-like openings on the dorsal plate near the pseudostigmata, as well as in certain other respects.

Trombicula setosa, new species.

Palpus rather short; second segment angulate laterally; first palpal seta with many barbs; second with 3 to 4 barbs; third simple. Palpal claw three or four pronged with inner one or two prongs longer than outer prongs. Dorsal plate more than twice as broad as long; front margin nearly straight; posterior margin outwardly rounded; without pair of slits near pseudostigmata. Pseudostigmata situated posterior to a line drawn between posterolateral setae, each being a little more than its diameter from median line; pseudostigmatic organs each with a few minute barbs. Eyes immediately lateral to dorsal plate, not situated on sclerotized plate; posterior eye equal to anterior and with cornea. Dorsal abdominal setae 56 to 60; first three transverse rows of setae with formula 14–14–10; other rows irregular in arrangement. Legs short; tarsus I with dorsal spine situated slightly more than its length from base of segment.

Length of engorged specimen, 0.48 mm.; width, 0.33 mm.

Type host.—White-footed mouse, *Peromyscus gossypinus gossypinus.*

Type locality.—Okefinokee Swamp, Georgia.

Type slide.—U. S. N. M. No. 1256.

Described from three specimens taken from type host at type locality, December 2, 1934, by E. V. Komarek (Bish. no. 22740) and one specimen taken from straw, Los Angeles, California, February 10, 1937, by E. R. Miller (Bish. no. 26926). This species differs from all others of the *akamushi* group occurring in the New World in having the palpal claw sometimes divided into four prongs and in having more than fifty dorsal abdominal setae.

Trombicula cynos, new species.

Palpus stout; second segment broadly rounded laterally; first palpal seta with a few barbs; second also with a few barbs; third with 3 to 4

barbs. Palpal claw with a large central prong surpassing the much smaller subequal, lateral ones. Dorsal plate minutely porose, slightly broader than long; anterior margin forming three subequal festoons; posterior margin forming a median angle; no slits near pseudostigmata. Pseudostigmata situated in front of a line drawn between the posterolateral setae and each about its diameter from median line. Pseudostigmatic organs very long, straight, subplumose, with many delicate barbs. Eyes large; anterior and posterior equal, contiguous, each with cornea. Dorsal abdominal setae about 32; first three transverse rows of setae with following formula: 8–6–6; other rows irregular in formation. Legs large; tarsus I with its rather short dorsal spine situated about twice its length from base of segment.

Length of unengorged specimen, 0.25 mm.; width, 0.16 mm.

Type host.—A raccoon, *Procyon lotor.*

Type locality.—Ithaca, New York.

Type slide (holotype).—U. S. N. M. No. 1257.

Described from a single specimen taken from type host at type locality by Dr. D. W. Baker. This very characteristic species is easily separated from all others of the *akamushi* group occurring in the New World by the peculiar shape of the dorsal plate. The single specimen at hand was taken from the ear of its host.

Trombicula dasyproctae, new species.

Palpus with second segment subangulate laterally; first palpal seta with 1 to 3 barbs; second with 0 to 3 barbs; third with a few barbs. Palpal claw with a large, stout central prong and two slender, shorter, inconspicuous lateral prongs. Dorsal plate broader than long, poorly sclerotized, with anterior margin almost straight and posterior margin rounded. Pseudostigmata situated between posterio-lateral setae and each about its diameter from median line. Anterior and posterior eyes equal, contiguous, not situated on a sclerotized plate. Dorsal abdominal setae 20 to 24; first row irregular, with 8 setae; second row with 6 setae; other setae not in rows. Legs of moderate length; tarsus I longer than tibia I and with dorsal spine situated about its length from base of segment.

Length of partly engorged specimen, 0.44 mm.; width, 0.24 mm.

Type host.—Agouti, *Dasyprocta punctata.*

Type locality.—Capira, Panama.

Type slide.—U. S. N. M. No. 1258.

Described from eight specimens taken from type host at type locality August 28, 1931, by L. H. Dunn. Except for the trifurcate palpal claw and equal anterior and posterior eyes this species is very similar to *Trombicula irritans* (Riley).

Trombicula mexicana, new species.

Palpus short, stout; large second segment subangulate laterally; first palpal seta simple; second and third simple. Palpal claw stout; middle prong stouter than the smaller, subequal lateral prongs, and surpassing the

latter. Dorsal plate minutely porose, broader than long, with anterior margin almost straight and posterior margin very broadly rounded. Pseudostigmata situated slightly anterior to a line drawn between posterolateral setae and each slightly less than its diameter from the median line and with a slit at its anterior border. Pseudostigmatic organ long, flagelliform, with a few very minute barbs on distal half. Anterior and posterior eyes equal, contiguous, not situated on a sclerotized plate. Dorsal abdominal setae 38 to 40; first row with 12 setae; second with 8 setae; third with 8 to 10 setae. Legs rather slender; tarsus I with dorsal spine situated about one and a half times its length from base of segment.

Length of engorged specimen, 0.55 mm.; width, 0.33 mm.

Type host.—A bat.

Type locality.—San Luis Potosi, Mexico.

Type slide.—U. S. N. M. No. 1259.

Described from four specimens taken from type host at type locality April 7, 1931, by R. A. Roberts (Bish. no. 12771) and five specimens taken from ear of *Eptesicus* sp. collected at Columbia, Missouri, March 23, 1936. This species is nearest *T. piercei* Ewing, described from the Philippines, from which it differs in having a more strongly sclerotized dorsal plate and fewer barbs on the pseudostigmatic organs.